

SOME VICTORIAN COPEPODA NEW TO SCIENCE.

(With Three Plates.)

BY J. SEARLE.

(Read before the Field Naturalists' Club of Victoria, 12th Dec., 1910.)

THE object of this short paper is to record the occurrence in Victoria of four species of Copepoda belonging to the genus *Brunella*.

Some three years ago, Mr. G. W. Smith, of the Oxford University, discovered on Bruni Island, Tasmania, a small Copepod whose structure differed so much from any fresh-water species hitherto known that it was found necessary to form a new genus for its reception. From the fact that the specimen was found on Bruni Island, and was not met with in any other part of Tasmania, Mr. Smith called the genus *Brunella* and the species *tasmanica*.

From the description * of the genus, kindly forwarded to me by Mr. Smith, I was confident I had met with a similar species here before I took up the systematic study of the group, and have kept a look-out for it since.

On the 22nd of October, while collecting at Cheltenham, I had the good fortune to take a number of specimens corresponding exactly with *Brunella tasmanica*, and this is the first record of the genus for Australia.

On 1st November, while at Nyora with the F.N.C. excursion, I was successful in capturing a new species of this interesting genus in a weedy pond near the railway line. It is much larger than *B. tasmanica*, and differs somewhat in the formation of the fifth thoracic limbs of the male and in the lateral projections on the fifth thoracic segment of the female, while the tenth, eleventh, and twelfth joints of the first antennæ in both male and female are bright red in colour, the rest of the antennæ being pale green.

I took this species in every form of development—from the nauplius to the ovigerous female—also two specimens which were attacked by a fungus, the threads of which were growing out between the joints of the animal's body and limbs.

I have called this species *Brunella australis*.

On 12th November fortune again favoured me with yet another species of *Brunella*. When living this specimen was of a most beautiful iridescent green colour. Its general appearance is similar to *B. australis*, but, while retaining the general characteristics of the genus, it differs somewhat in structure from that species.

I have called this species *Brunella viridis*.

The fourth species was taken in the Yan Yean Reservoir,

* Trans. Lin. Soc. London, vol. xi., pt. 4, 1909.

and, from the shape of the fifth thoracic limb of the male I have named it *Brunella ampulla*.

The following is a detailed description of the genus and species recorded :—

ORDER—COPEPODA.

FAMILY—DIAPTOMIDÆ.

GENUS—*Brunella*.

The distinguishing features of the thoracic limbs in the genus *Brunella* are—

- (a) The first thoracic limb has the outer branch (exopodite) 2-jointed, and the inner branch (endopodite) 1-jointed.
- (b) The second, third, and fourth limbs have the outer branch 3-jointed and the inner branch 2-jointed.
- (c) In the male the fifth thoracic limbs differ from each other. The right limb has the outer branch 2-jointed, the last joint being spatulate and tipped with a small spine; the inner branch of this limb is 2-jointed, with an extra internal lobe. The left limb has the outer branch 3-jointed, and ending in a very long curved claw; the inner branch of this limb is 3-jointed.
- (d) In the female the fifth thoracic limbs have the outer branch 3-jointed and the inner branch 2-jointed.

This combination of characters is found in no other fresh-water Copepod.

BRUNELLA TASMANICA, G. W. Smith.

Female.—The body is cylindrical. The head segment has a slight lateral depression, and tapers towards the front, and is longer than the two following segments.

The fifth segment has small lateral projections, which are two-lobed, the larger external lobe having rounded ends, the inner lobe small and more sharply pointed. The first abdominal segment is somewhat swollen, and the operculum or plate covering the genital openings is very large. The abdomen has three distinct segments, and the furcal processes are segmented from their base, which might almost be called another segment. The furcal processes are as long as the first abdominal segment, and are each furnished with five plumose setæ—four terminal and one lateral. These setæ are nearly half as long again as the furcal processes.

The first antennæ exceed the body in length, and consist of 27 joints. The second antennæ, mandible, maxilla, and maxillipedes are similar in structure to those of *Boeckella*.

The first thoracic limb has the outer branch 2-jointed and the inner branch 1-jointed. The second, third, and fourth limbs closely resemble each other, and have the outer branch 3-jointed and the inner 2-jointed. The fifth limb of the female has the

outer branch 3-jointed, the second joint carrying a stout spine, which is not plumose; the inner branch is 2-jointed.

Colour.—Green.

Length.—.75 mm. to 1 mm.

Occurrence.—Cheltenham, Victoria.

Distribution.—Bruni Island, Tasmania.

The Male.—The male is somewhat smaller than the female. The abdomen has five distinct segments, and the antenna on the right side is geniculated or jointed in such a manner as to be used as a clasping organ.

The fifth pair of legs are very remarkable. The right leg has the outer branch 2-jointed, the joints being flattened and expanded: the second joint terminates with a short, stout spine. The inner branch is 2-jointed, the second joint bearing four long setæ. The other joint has a peculiar lobe or projection on it, and yet another internal lobe attached to its base. The left leg has the outer branch 3-jointed, the last joint being prolonged into a curved spine or claw. There is a small spine at the top of the first joint, and another small spine on the inner base of the claw. The inner branch is 3-jointed, the last joint bearing four setæ.

BRUNELLA AUSTRALIS, J. Searle, n. sp.

This is a larger and more beautiful species than *B. tasmanica*. The structure of the mouth parts and number of joints in the thoracic limbs agree with *B. tasmanica*, the principal differences being—

Female.—In the female the lateral projections on the fifth thoracic segment are very conspicuous, the outer lobes being long and pointed, the inner very small and rounded at the end. The fifth pair of limbs have one or two additional spines or setæ on the external branch.

The first antennæ have, at about equal distances apart from base to top, four setæ that are very much longer than the other setæ on the antennæ, and extend forward, while at the end of the third last joint there is a long seta that extends backwards. The tenth, eleventh, and twelfth joints of each of the first antenna are of a bright red colour, contrasting greatly with the rest of the antenna, which is of a pale green colour.

Male.—As is general with the Copepoda, the male is smaller than the female.

The fifth pair of legs are even more remarkable than those of *B. tasmanica*. In the right leg the second joint of the external branch, instead of being spatulate, as in *B. tasmanica*, is placed somewhat at an angle with the first joint, and is curved outwards and rounded at the end, the concave surface being covered with minute projections or spines. The left leg has a small spine on the first joint of the outer branch, a longer

spine on the second joint, but has no spine on the claw. These curiously shaped limbs are used by the animal during copulation, though the exact manner in which they are used is still somewhat obscure, the act being so rapid that the eye could not grasp every movement of the limbs, though it has been observed repeatedly. What happens appears to be this:—The male, with his right antenna, clasps the female, and hooks the long curved claw of the left thoracic foot round her abdomen. At first the female struggles to escape from his embrace, and thus locked together they pull each other about the observation tank, finally sinking slowly to the bottom of the tank, where they may remain several hours, or, again, the whole act may be accomplished in a few seconds. When the psychological moment arrives, the male appears to lift the operculum of the female with the curious second joint of the right leg, while the spermatophore is attached by its open end, which is the last part to leave the body of the male, close to the genital opening of the female, the leg, I think, being used to attach it, the whole act being accomplished in about $\frac{1}{3}$ of a second.

Colour.—Green, with red band on the antennæ.

Length.—1.75 mm.

Occurrence.—Nyora, 55 miles S.E. from Melbourne.

BRUNELLA VIRIDIS, J. Searle, n. sp.

In appearance and size this species resembles *B. australis*, but is of a beautiful iridescent green colour when living.

Female.—The head and segment fused to it is longer than the succeeding two segments, the head being more rounded than *B. australis*. The lateral projections on the fifth thoracic segment differ from those of *B. australis*, and it does not possess the red band on the antennæ.

Male.—The fifth pair of legs of the male differ from those of *B. australis*, as shown in the figure.

Colour.—Iridescent green.

Length.—1.75 mm.

Occurrence.—Heidelberg.

BRUNELLA AMPULLA, J. Searle, n. sp.

This is a small species, and was taken in a tow-net, together with several other species of Copepoda.

Female.—Head and segment fixed to it is longer than the two following segments. The fifth thoracic segment has lateral projections that are not symmetrical—that on the right side being longer than that on the left, and the ends are rounded. The first antennæ are longer than the extreme length of the animal, and contain 25 joints. The second antennæ are smaller than is usual, while the mandibles, maxillæ, first and second maxillipedes are large in comparison with the size of the animal, and the setæ that terminate the first-fourth thoracic

limbs are extremely long. The fifth thoracic limbs have the characteristic spur on the second joint of the external branch, the inner branch being 1-jointed.

Male.—The male is smaller than the female. First antenna geniculated on the right side; fifth thoracic limb—on left side, external branch 3-jointed, the second joint carries a spine on the inner side, the last joint being prolonged into a claw. Inner branch 1-jointed, of a peculiar shape, well adapted for clasping or holding. Right limb, external branch 1-jointed, swollen in the middle, and then tapering like the neck of an ancient flask or vase, the end then expanding on one side, and furnished with minute hooked setæ. Inner branch also 1-jointed, straight, much longer than the outer branch, and terminating in four stout setæ.

Length.—.75 mm. to 1 mm.

Colour.—Green.

Occurrence.—Yan Yean Reservoir.

Distribution.—Keilor-road, Essendon (collected by Mr. E. Creed).

DESCRIPTION OF PLATES.

PLATE XII.—Fig. 1, *Brunella australis*, female, $\times 35$. Fig. 2, maxillipede, male. Fig. 3, right, first antenna, male. Fig. 4, second antenna, male. Fig. 5, fifth thoracic leg, male, left. Fig. 6, fifth thoracic leg, male, right. Fig. 7, fifth thoracic leg, female.

PLATE XIII.—Fig. 1, *Brunella viridis*, female, $\times 35$. Fig. 2, fifth thoracic leg, male, right. Fig. 3, fifth thoracic leg, male, left. Fig. 4, maxillipede, male. Fig. 5, first antenna, male. Fig. 6, fifth thoracic leg, female.

PLATE XIV.—Fig. 1, *Brunella ampulla*, female, $\times 35$. Fig. 2, second maxillipede, male. Fig. 3, fifth thoracic pair, male—*R* right, *L* left. Fig. 4, fifth thoracic leg, female. Fig. 5, biting edge of mandible. Fig. 6, first maxillipede, male. Fig. 7, maxilla, male.

BIOLOGICAL SURVEY OF WILSON'S PROMONTORY.

FLOWERING PLANTS AND FERNS—THIRD REPORT.*

BY ALFRED J. EWART, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany and Plant Physiology in the Melbourne University.

(Read before the Field Naturalists' Club of Victoria, 12th December, 1910.)

As the result of a third visit to the National Park, Messrs. Audas and St. John brought back a third collection of the flowering plants and ferns from the National Park, which, on examination, were found to include a number of species hitherto unrecorded, the names of which are given in the accompanying list. They include a number of water plants, for which a special search was made, and, in addition, two non-flowering

* For first report, with map, see *Victorian Naturalist*, vol. xxv., p. 142 (January, 1909); for second report, *idem*, vol. xxvi., p. 129 (January, 1910).

PLATE XII.

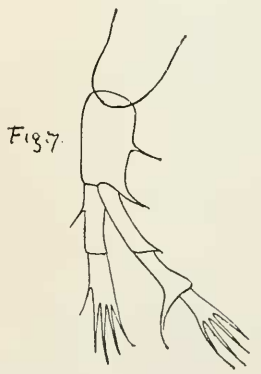
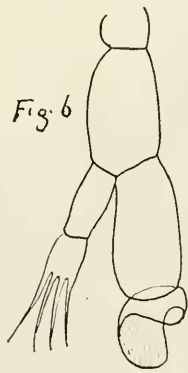
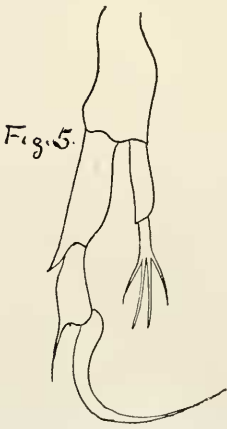
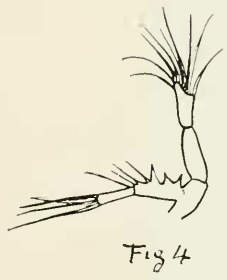
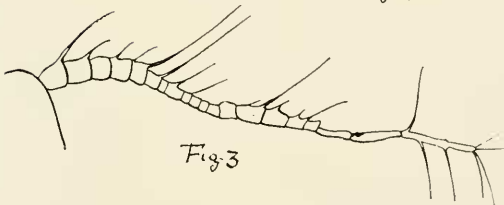
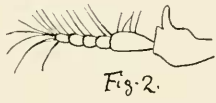
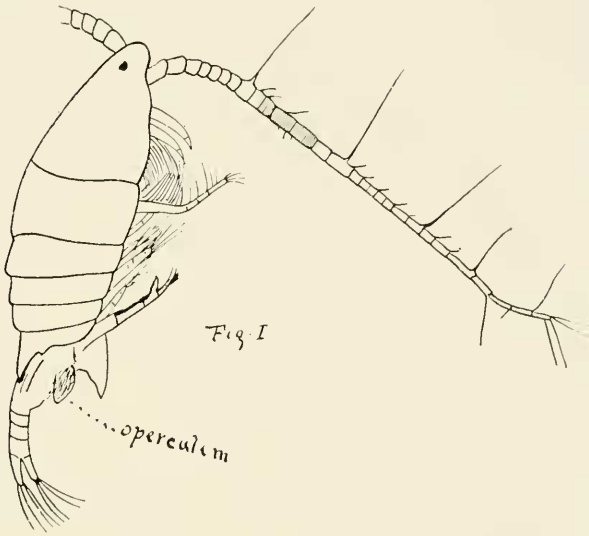


PLATE XIII.

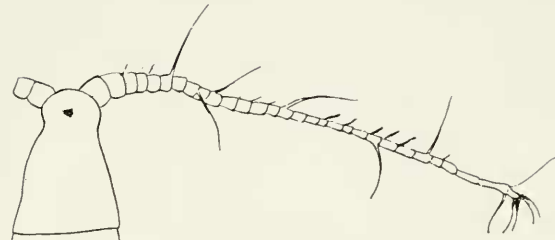


Fig. 1



Fig. 2

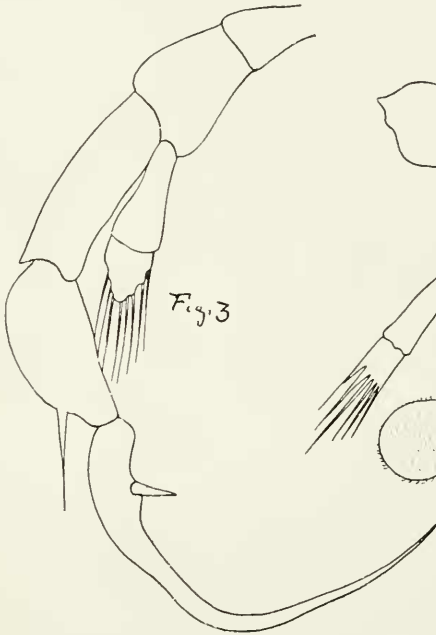


Fig. 3

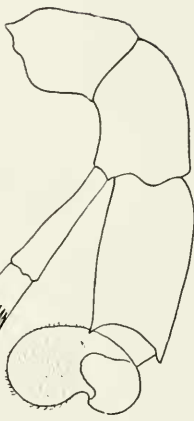


Fig. 4



Fig. 5

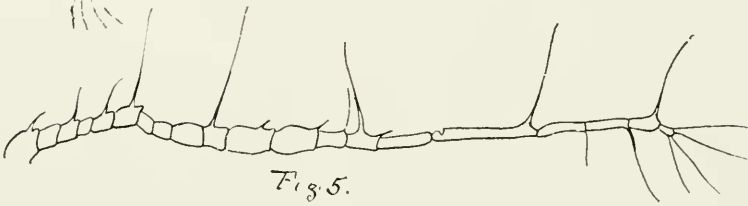


Fig. 6

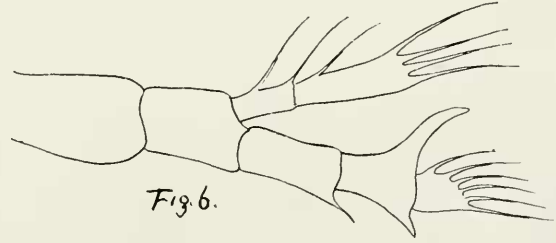


Fig. 7

PLATE XIV.

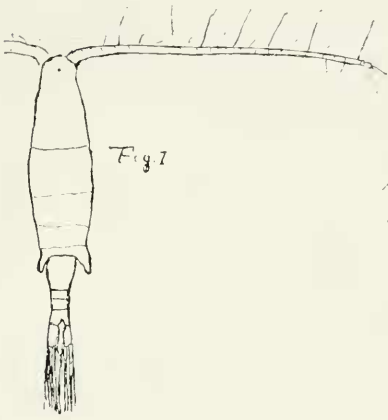


Fig. 1

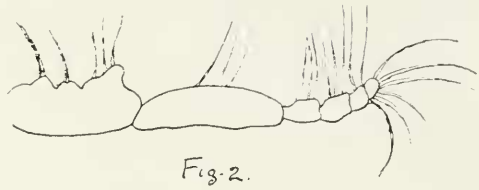


Fig. 2.

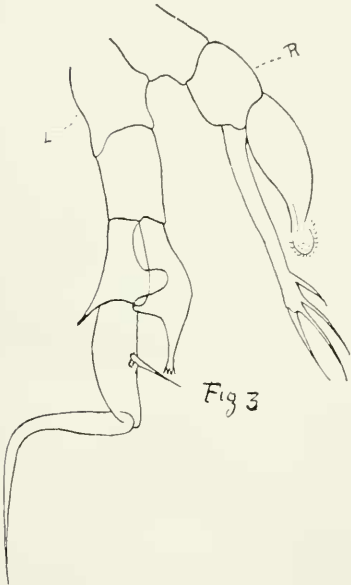


Fig. 3



Fig. 4.



Fig. 5

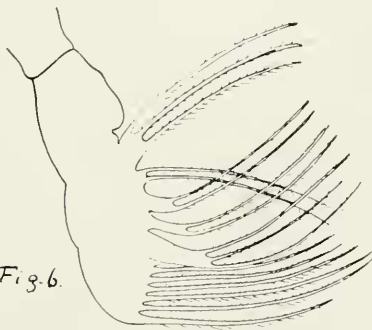


Fig. 6.

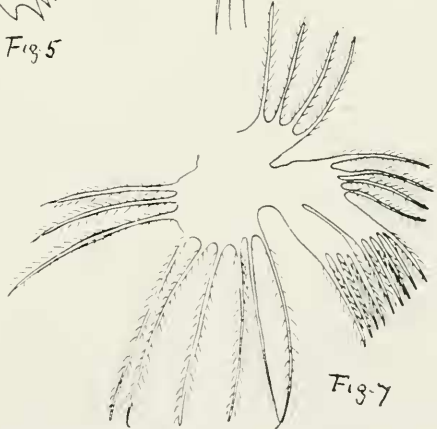


Fig. 7

plants—namely, *Chara fragilis*, Desv., and *Nitella gelatinosa*, A. Br.—were found growing in fresh water near Five-Mile Beach. The number of plants on the present list is naturally small as compared with the numbers obtained in previous years, and it is not likely that any appreciable number of flowering plants or ferns remain to be recorded for the National Park. During the present year, in fact, several parts traversed by Messrs. Audas and St. John in previous years were closely re-examined, but without the addition of a single unrecorded species to the list. The present list includes 40 genera and 50 species, of which latter 42 species are native to Victoria and 8 (marked with an asterisk in the list) are naturalized aliens. Excluding, therefore, one or two doubtful specimens which may ultimately be added to the list, the total for the National Park consists of exactly 600 native flowering plants and ferns and 50 naturalized aliens. One-twelfth of the flora, therefore, consists of naturalized aliens, whereas approximately one-fifth of the flora of the whole of Victoria consists of naturalized aliens. The difference is, however, much more striking than this comparison shows, for in the National Park the naturalized aliens are for the most part sparsely and sparingly distributed, and they seem only able to hold their own in special localities, where the interference of man has brought about the conditions needed for their successful development. In some cases, more particularly along the tram track at Sealers' Cove, thistles, for instance, seem to be much less abundant than they were in former years, and they do not seem able to successfully establish themselves among the undisturbed native scrub.

Two plants are worthy of special comment—

Acacia longifolia, Willd., var. *floribunda*.—This specimen, though without flowers or fruit, apparently belongs to this variety, but the phyllodes are longer and narrower than usual, some of them exceeding 6 inches in length.

Polypodium grammitidis, R. Br.—This interesting fern is mainly Tasmanian, being usually found among alpine rocks or gullies. It is only known in Victoria from the Dandenong Ranges, so that the plant from the National Park forms an interesting link with the Tasmanian flora.

Now that the list of the flora of the National Park is completed, it may be found advisable to construct a small handbook or key to the flora of the Park for the benefit of visitors. Such a handbook would, however, be of temporary use only, since it is the intention of the trustees ultimately to introduce into the National Park specimens of all native plants of Victoria which are likely to thrive there, and more especially such as are specially interesting from a scientific standpoint, or which are in any danger of extinction in their native Victorian localities.

The successful introduction of a large number of new native plants would, of course, make a handbook based on the present lists of little value, but everything would naturally depend on the amount and success of the attempted additions to the Park flora.

PLANTS COLLECTED OCTOBER, 1910. NOT RECORDED IN PREVIOUS
LISTS FOR THE NATIONAL PARK, WILSON'S PROMONTORY.

<i>Acacia longifolia</i> , Willd., var. <i>floribunda</i>	Boat Harbour Hill
" <i>longifolia</i> , Willd., var. <i>Sophoræ</i>	Five-Mile Beach
" <i>salicina</i> , Lindl.	Collected by F. v. Mueller, 1853
<i>Acianthus exsertus</i> , R. Br.	Mt. Leonard
<i>Agrostis venusta</i> , Trin.	Near Mt. Oberon
<i>Brachycome scapiformis</i> , D. C.	Mt. Leonard
<i>Cardamine parviflora</i> , L.	Near Five-Mile Beach
<i>Centrolepis fascicularis</i> , Labill.	Near Vereker Range
* <i>Cerastium quaternellum</i> , Fenzl	Near Vereker Range
<i>Comesperma ericinum</i> , D. C. (white var.)	Near Waterloo Bay
<i>Cotula australis</i> , Hook f.	Near Vereker Range
" <i>filifolia</i> , Thunb.	Side of Mt. Norgate
<i>Daviesia ulicina</i> , Sm., var. <i>ruscifolia</i>	Mt. Leonard
<i>Eodela verticillata</i> , F. v. M.	Near Five-Mile Beach
<i>Eucalyptus Gunnii</i> , Hook f., var. <i>acervula</i>	Near Vereker Range
" <i>Sieberiana</i> , F. v. M.	Collected by F. v. Mueller, 1853
* <i>Fumaria officinalis</i> , L.	Near Darby River
<i>Glyceria fluitans</i> , R. Br.	Near Five-Mile Beach
* <i>Gnaphalium candidissimum</i> , Lam.	Near Mt. Oberon
<i>Gratiola peruviana</i> , L., var. <i>pumila</i>	Near Mt. Oberon
<i>Helichrysum rosmarinifolium</i> , Less.	Five-Mile Beach
<i>Hemarthria compressa</i> , R. Br.	Five-Mile Beach
<i>Hydrocotyle asiatica</i> , L.	Near Five-Mile Beach
" <i>callicarpa</i> , Bunge	Mt. Leonard
" <i>vulgaris</i> , L.	Near Five-Mile Beach
* <i>Lycium horridum</i> , Thunb.	Near Darby River
* <i>Mentha Pulegium</i> , L.	Near Vereker Range
<i>Mesembryanthemum australe</i> , Sol.	Side of Mt. Norgate
<i>Myriophyllum amphibium</i> , Lab.	Near Vereker Range
" <i>elatinoides</i> , Gaud.	Near Five-Mile Beach
* <i>Nasturtium officinale</i> , R. Br.	Near Five-Mile Beach
<i>Platylobium obtusangulum</i> , Hook.	Mt. Vereker
<i>Polypodium grammitidis</i> , R. Br.	Mt. Vereker
<i>Potamogeton lucens</i> , L.	Near Five-Mile Beach
<i>Pterostylis parviflora</i> , R. Br.	Near Mt. Oberon
" <i>pedunculata</i> , R. Br.	Mt. Leonard
" <i>reflexa</i> , R. Br.	Mt. Leonard
" <i>vittata</i> , Lindl.	Mt. Leonard
<i>Pultenæa canaliculata</i> , F. v. M.	Side of Mt. Norgate
<i>Scirpus inundatus</i> , Spreng.	Side of Mt. Norgate
<i>Sebæa albidiflora</i> , F. v. M.	Five-Mile Beach
<i>Selaginella Preissiana</i> , Spreng.	Near Vereker Range
* <i>Senecio elegans</i> , L.	Five-Mile Beach
<i>Spergularia rubra</i> , Cam.	Near Darby River
<i>Thelymitra longifolia</i> , R. and G. Forster	Mt. Leonard
* <i>Trifolium arvense</i> , L.	Near Darby River
<i>Viola hederacea</i> , Lab. (white var.)	Five-Mile Beach
<i>Woodwardia aspera</i> , Mett.	Mt. Vereker
<i>Xanthosia dissecta</i> , Hook f.	Near Mt. Oberon
<i>Xanthosia pilosa</i> , Rudge	Mt. Leonard.

The Victorian Naturalist.

VOL. XXVII.—No. 10. FEBRUARY 9, 1911.

No. 326.

FIELD NATURALISTS' CLUB OF VICTORIA.

THE ordinary monthly meeting of the Club was held at the Royal Society's Hall on Monday evening, 13th January, 1911.

Mr. J. A. Kershaw, F.E.S., one of the vice-presidents, occupied the chair, and about 45 members and visitors were present.

CORRESPONDENCE.

From Chief Inspector of Fisheries and Game, stating that the Minister of Agriculture had decided to adhere to his intention of altering the opening of the shooting season for Quail from 1st March to 15th February, and that this decision had only been arrived at after searching inquiry and mature consideration.

The Chairman stated that the Advisory Committee on the *Game Act* had protested against the alteration.

REPORTS.

A report of the excursion to Heidelberg on Saturday, 14th January, for pond life, was given by the leader, Mr. J. C. Kaufmann, LL.D., who reported an interesting and profitable afternoon.

ELECTION OF MEMBERS.

On a ballot being taken, Miss Georgina Sweet, D.Sc., Brunswick, and Mr. W. Gay, Surrey Hills, were duly elected as ordinary members of the Club.

PAPERS READ.

1. By Mr. J. A. Kershaw, F.E.S., entitled—"The Migration of Eels in Victoria."

The author related that he had recently had an opportunity of witnessing, at the Hopkins Falls, near Warrnambool, an "eel-fare" or the ascent of the young elvers up a stream from the sea, and at the falls had seen them ascending almost vertical wet rocks, though with some difficulty, and submitted specimens of the eels, and photographs showing the creatures in the act of wriggling up the rocks.

Messrs. Pitcher, Cole, Barnard, and Hardy congratulated the author on the successful results of his investigations, the latter complimenting him on the photographs, which were only obtained at the expenditure of much patience and risk.

2. By Mr. J. W. Audas, entitled—"Recent Botanical Investigations at Wilson's Promontory."

The author described the route taken by himself and Mr. P.

R. H. St. John during their recent visit to the National Park, Wilson's Promontory, on behalf of the National Herbarium, and made a number of interesting remarks on the habitats of the various plants found, a list of which was given in Professor Ewart's report in the January *Naturalist*.

EXHIBITS.

By Mr. F. G. A. Barnard.—Growing Victorian fern, *Polypodium serpens*.

By Mr. C. F. Cole.—Series of bird-skins from Mallee, Victoria, viz. :—Black-eared Cuckoo, *Mesocalius palliolatus*, Lath. ; Gilbert's Thickhead, *Pachycephala gilberti*, Gld. ; Scrub-Robin, *Drymacedus brunneiopygius*, Gld. ; Lesser Brown Flycatcher, *Micræca assimilis*, Gld. ; Striated Grass-Wren, *Amytis striata*, Gld. ; Purple-backed Wren, *Malurus assimilis*, North ; Black-backed Wren, *M. melanonotus*, Gld. ; Mallee Emu-Wren, *Stipiturus mallee*, Camp. (new to science) ; Red-rumped Ground-Wren, *Hylacola cauta*, Gld. ; White-fronted Honey-eater, *Glycyphila albifrons*, Gld. ; and Striped Honey-eater, *Plectorhamphus lanceolatus*, Gld.

By Mrs. A. D. Hardy.—Young of Grass-Parrot, *Psephotus hæmatonotus*, three days old.

By Mr. A. D. Hardy, F.L.S.—Freshwater alga, *Bulbochæte Brebissonii*, Kutz, collected at Willsmere, 1904 (new record for Australia) ; pollen grains of *Eucalyptus elæophora*, F. v. M., taken from collecting basket of common bee, *Apis mellifica* ; pot-grown plant of *Lomatia longifolia*, collected at West Warburton as an inch-high seedling.

By Mr. J. A. Kershaw, F.E.S., for National Museum.—Elders (young eels), from Hopkins Falls, near Warrnambool, and photographs in illustration of paper ; Gippsland Emperor Moth, *Antheræa helena*, and living larvæ of same ; small colony of ants, *Amblyopone*, sp., taken at Ferntree Gully by Mr. F. Spry.

By Mr. G. Lyell.—Dried specimens of orchid, *Caleya minor*, from Pyrete Ranges, near Gisborne, collected in January.

By Mr. D. J. Mahony, B.Sc.—Mineralogical specimens, including Selwynite, from Heathcote ; olivine crystals, from scoria pits near Terang ; barytes, from near Gellibrand River ; chloropal, from Mt. William ; corundum, from Mt. Wellington ; and carbonate of bismuth (with quartz), from Bonang, all Victorian localities. Mica schist, with sapphires, from Mt. Painter, South Australia ; auriferous quartz, from Bullfinch, Western Australia ; and amblyonite, a fluophosphate of aluminum and lithium, from near Coolgardie, Western Australia (when found last year, first record for Australia).

By Mr. W. H. A. Roger.—Specimens of the "blue" butterfly, *Miletus delicia*, from chrysalides taken at Warburton on Christmas Day.

By Mr. J. Searle.—Specimens of the new Copepod, *Brunella ampulla*, described in January *Naturalist*, also rotifers, &c., mounted for microscope.

By Mr. F. Spry.—Beetle, *Onthopagus mnistyechi*, Harold, also ball of dung containing perfect insect; beetles associated with ants and termites, collected at Fern-tree Gully, October, 1910.

By Mr. P. R. H. St. John.—Dried specimens of *Humea elegans*, Smith, collected at Mueller River, East Gippsland, from plants over twenty feet high; fern, *Gleichenia dichotoma*, Hooker; and *Rubus moluccanus*, L., from Newton's Creek, near Cabbage-tree Creek, East Gippsland.

After the usual conversazione the meeting terminated.

EXCURSION TO KEW.

KEW was placed on the excursion list for the current year with the view of devoting an afternoon to the determination of the several kinds of eucalypts and larger growing shrubs to be found in certain parts of that interesting suburb. On meeting at the Junction at the appointed time on Saturday, 26th November, it was decided to first of all visit Studley Park, then proceed through the Yarra Bend grounds to the Kew Asylum reserve, making, in all, a ramble of rather more than three and a half miles. The day was a pleasant one, and the small party of members present were charmed with the variety of the scenery met with during our walk. Some remarks on the situation of the park, and its geological features, may be helpful in following the report of the outing. Studley Park is situated on the generally eastern side of the River Yarra, which in this portion of its course is very sinuous, and is Silurian country, with small alluvial flats in places and with gravel caps to the spurs. Some of the spurs end in steep rocky declivities at the river edge. Alternating with the spurs are small valleys, some of them well wooded. These several features bear distinctive vegetation, which affords excellent harbour for numerous species of birds.

The park may be approached from the city by two main routes—by the Carlton and Abbotsford tram line to Johnston-street Bridge, by which entrance two excursions have recently reached the western portion of the park; or by the Victoria-street tram line to the Walmer-street footbridge, at its south-eastern corner; or continuing the journey by the Kew horse-tram, it may be approached *via* Studley Park-road from the Junction at Kew (which, by the way, is also close to Kew railway station), the route taken on the present occasion. It is probable that no other reserve has the

same amount of water frontage in proportion to area. Thus, the 200 acres of park land here is skirted by about four miles of deep river. The area is separated by roads into three portions. The southern portion, between Walmer-street and Studley Park-road, contains the recently formed trout hatcheries; the central area, in the angle formed by Johnston-street Bridge-road and Studley Park-road, contains the Dight's Falls pumping station reservoir; while the largest, northern part lies between the last-named road and the river, opposite the Yarra Bend Asylum, and has at its western extremity the Dight's Falls pumping station, while an old aborigines' look-out and camp, where still "skinning flakes" of quartzite and flint may be picked up as the bluff weathers, is situated not far from the Falls. Excepting one short line, the most eastern boundary of the northern area, the park is enclosed by road and river.

The northern area offers the best field to the nature student, and to this we gave attention. The greater part is well wooded with several species of *Eucalyptus*, none very tall; but there are also groves of *Acacia pycnantha*, a less quantity of *Acacia decurrens*, var. *mollis*, and fine specimens of the "Prickly Box," *Bursaria spinosa*, which, in flowering season, is a good "collecting-ground" for the entomologist. A few trees of the "Lightwood," *Acacia implexa*, were noted, as well as small specimens of the Blackwood, *A. melanoxylon*, two species which are often confused. The eucalypts are approximately distributed in zones, as follows:—The Red Gums, *E. rostrata*, as naturally would be expected, are found on the river banks and flats or gentle slopes near the river. Some of those which once grew at the water's edge had their roots drowned, owing to the bases of their stems being submerged by a permanent rise of water when the height of the Dight's Falls weir was increased some years ago, and the dead trees are now whitened skeletons, not without value in the picturesqueness of the neighbourhood. Some of the Red Gums have boles so smooth and white that many frequenters of the river call them White Gums. The next species of moisture-loving character is the Manna Gum, *E. viminalis*, in some parts called White Gum and "Ribbon Gum." This species grows well near the waterside, but ascends the small valleys to near the crest of the ridges, meeting on the way the Yellow Box, *E. melliodora*, and the rosette-umbelled variety (*acervula*) of the Swamp Gum, *E. gunnii*; while in more exposed places, and occupying more particularly the open, hungry-looking spur-tops, is the "Smooth Ironbark," *E. leucoxylon*, in large patches. Others are less frequent, and near the roadside, in a fenced-off plantation, three introduced species may be seen—viz., *E. botryoides*, *E. globulus*, and *E. corynocalyx*. Of these,

the first-named gives best results, the large, broad leaves giving a good shade. *E. viminalis* and *E. melliodora* may be seen in various stages of decortication, irrespective of aspect, soil, or season, and these species, and sometimes *E. gunnii*, var. *acervola*, may be indifferently placed in the sections of the cortical system *Leiophloia* or *Hemiphloia*, but would sometimes be placed without doubt in one or the other. Students of the native flora may find along the river bank only traces of the once abundant Silver Wattle, *A. dealbata*, the principal shrubs being now *Callistemon salignus*, *Melaleuca ericifolia*, *Leptospermum flavescens*, *Pomaderris apetala*, *Kunzea peduncularis*, *Coprosma Billardieri*, and occasionally *Hymenanchera Banksii*, the "Tree Violet." On the declivities which end the spurs a fair shrubbery exists, comprising stunted eucalypts, *Myoporum viscosum*, *Casuarina quadrivalvis* (syn. *C. stricta*), *Exocarpus cupressiformis*, *E. spartea*, *Acacia pycnantha*, &c. The twining parasite *Cassytha melantha* and *Clematis microphylla* link together shrubs of different species. A few plants of the introduced and now outlawed gorse, *Ulex Europæa*, are held in subjection by the *Cassytha*. Horses graze in the park, and probably keep down many small shrubs and herbs, for of the large number recorded in the *Naturalist* in 1885 (vol. i., p. 172 *et seq.*) by Mr. F. Reader in a partial flora of the park, and with notes in systematic order on their economy and etymology, very many are now absent or difficult to find. At that time Mr. Reader estimated the flora of the park at 271 species, of which 67 had been introduced, thus leaving 204 species, representative of 58 natural orders. For other notes on the historical and geographical aspects of the park, those interested might read Mr. F. G. A. Barnard's recently issued "History of Kew."

Having exhausted the northern section of the park, we crossed in the ferry boat to the Yarra Bend side of the river, and made our way towards the old tramway bridge (now a footbridge), forming a connection with the Kew Asylum grounds. Nothing of interest was seen on our way across the level basaltic plain, but as soon as the river was crossed the wooded Silurian slopes on the Kew side afforded many objects of interest in the way of plants and birds. A visit was paid to the little enclosure, kindly fenced in at the request of the Club by the Asylum authorities some years ago, in order to protect a small, isolated patch of *Styphelia strigosa*, which, Mr. Barnard had pointed out, was the only occurrence of the species nearer than South Morang, on the Plenty. It was found to be doing well since the cattle had been prevented from browsing on it, and quite a number of other plants were reaping the benefit of the protecting fence, though it is of a very simple character.

In addition to some of the shrubs already mentioned, Mr. St. John noted the following species among the smaller plants as being in bloom:—*Asperula oligantha*, *Brunonia australis*, *Convolvulus erubescens*, *Cynglossum suaveolens*, *Arthropodium strictum*, *Echinopogon strictus*, *Goodenia ovata*, *Hypericum japonicum*, *Helipterum dimorpholepis*, *Kennedyia prostrata*, *Lagenophora Billardieri*, *Leptorrhynchus squamatus*, *Poranthera microphylla*, *Pimelea curviflora*, *P. humilis*, *Vittadinia australis*, and *Viola hederacea*. To the same observer I am indebted for the names of the birds seen during the afternoon—viz., Reed-Warbler, *Acrocephalus australis*; Masked Wood-Swallow, *Artamus personatus*; White-browed Wood-Swallow, *A. superciliosus*; Wood-Swallow, *A. tenebrosus*; Sacred Kingfisher, *Halcyon sanctus*; Black-faced Cuckoo-Shrike, *Coracina robusta*; Mud-Lark, *Grallina picata*; Rufous-breasted Thickhead, *Pachycephala rufiventris*; White-plumed Honey-eater, *Ptilotis penicillata*; and Black Fantail Flycatcher, *Rhipidura tricolor*.

It is proposed to repeat next season the aquatic excursion of last year, for by means of boats only can the variety of hill and dale, of flat woodland and shrubby cliff, be seen in one afternoon.—A. D. HARDY.

EXCURSION TO HEIDELBERG.

THIS excursion took place on Saturday, 11th January, when a small party of seven assembled at Heidelberg to investigate the ponds. The small, dark pond near the river is a favourite resort, but is difficult of access, the land being jealously guarded by private owners. It is reported that on one occasion the owner, with a loaded gun, stopped a University professor and a number of leading scientists, and forced them to beat a hasty retreat. Profiting by experience, and through the courtesy of Mr. Shephard, we were enabled to pay a friendly visit to the owner and obtain his permission to visit the pond, under a promise not to stray. We visited three waterholes, all of which were teeming with life. In the dark pond every dip gave numerous clusters of *Conochilus dossuaris*, and from a fallen tree, projecting some distance into the water, some fine patches of fresh-water sponge with statoblasts were collected. Returning, a muddy waterhole was examined, and from the weeds fringing the margin numerous colonies of *Megalotrocha albo-flavicans* were obtained, and a sweep of the net showed *Daphnia carinata* largely developed, and numerous other forms of Entomostraca with larvæ. Water Mites, *Pterodina patina*, several forms of beetles, diatoms, and desmids. We then tried the lagoon near the bridge, and there obtained

Melicerta ringens and *Limnias ceratophylli*, *Volvox globator*, and *Rotifer vulgaris*. Other rotifers collected, which have been identified by Mr. J. Shephard, were *Lacinularia elliptica*, *L. socialis*, *Floscularia ornata*, *Salpina brevispina*, *Dinocharis tetractis*, *Philodina citrina*, *Euchlanis*, sp., and *Monostyla*, sp. The day was genial, and altogether a very pleasant and highly satisfactory afternoon was spent.—J. C. KAUFMANN.

NOTE ON THE HABITAT OF GRANT'S BIRD OF PARADISE (*Paradisea granti*, North).—In describing *Paradisea granti* in the *Victorian Naturalist* (vol. xxii., p. 156, January, 1906) some years ago, nothing was known as to where the specimen was procured, but I surmised that it was in some part of German New Guinea. Since the species was described, from time to time many specimens have been brought to Sydney, but all efforts failed to elicit any information as to the part of New Guinea from which they were obtained. Last year the Trustees of the Australian Museum purchased several species of Birds of Paradise from Mr. Charles Richart, who collected them in different parts of German New Guinea. Among them were three beautiful specimens of *Paradisea granti*, and I embraced the opportunity of obtaining the required information of the habitat of this species. Mr. Richart told me that he found *Paradisea granti* at Kuri Kuri, 90 miles south of Frederick Wilhelmshafen, and at Bokowa and Samo Harbour, Huon Gulf, 230 and 245 miles respectively south of the same locality. The birds were all procured in the dense jungle, and this species was not found farther inland than 50 miles from the coast. Notwithstanding that one has to pay a licence to shoot, and there is an export duty on all bird-skins sent out of German New Guinea, Mr. Robert Grant, Taxidermist of the Australian Museum, after whom this species is named, informed me that during last year he saw over thirty specimens of Birds of Paradise, consisting of about an equal number each of *Paradisea finschi* and *P. granti*, transformed into hat ornaments or other adornments for the fair sex.—ALFRED J. NORTH. Australian Museum, Sydney, January, 1911.

ANTS AND THEIR WAYS.—A careful study has recently been made at the Dresden (Germany) Forestry School of the habits of a certain species of ant, which is both a leaf-cutter and a seed-gatherer. It was found that most of the seeds, especially those of leguminous plants, were allowed to germinate before the ants put them out to dry, evidently to allow the seed-coat to burst: but the germination was not allowed to go far enough to ferment the starch into sugar. When the seeds were dry and dead the ants took them back into the nest, chewed them into a dough, which was then baked in the sun in the form of minute biscuits, these being stored in the nest for future use!—*English Mechanic*, 9th September, 1910.

A SHORT RAMBLE ALONG THE LERDERDERG.

BY J. G. O'DONOGHUE AND P. R. H. ST. JOHN.

(Read before the Field Naturalists' Club of Victoria, 11th Dec., 1910.)

A GLANCE at a map of the county of Bourke will show that the Lerderderg rises in the ranges to the north-west of Mount Blackwood, and flows in a more or less south-easterly direction to mingle its waters with those of the Werribee a short distance below the township of Bacchus Marsh.

Traversing as it does a large area of Palæozoic country, it invariably presents a turbid appearance, and this turbidity is even more accentuated when the stream is viewed from one of the many precipitous and timbered ranges by which its course, for the greater part, is margined.

Though not possessed of such striking and picturesque features as are to be seen along the Werribee in the neighbourhood of the well-known Gorge, the Lerderderg is not altogether destitute of that scenic beauty which appeals to the average sight-seer, and, at that point where it issues from the hills, presents many pleasing views capable of leaving more than a lingering impression on the mind. Many natural features interesting to the geologist abound, and many kinds of vegetation exist which prove as engaging to the botanist as the birds that frequent the coverts along the stream are to the ornithologist.

Though both of us had visited the locality before, the recollection of the pleasure then derived induced a further visit to somewhat familiar scenes—this time in company.

A narration of the trip, though it was of necessity a brief one, barely extending over eight hours, may prove of interest to those who, though they may be familiar with the Werribee Gorge and its environs, have yet to make the acquaintance of the Lerderderg and its encompassing hills.

Leaving Spencer-street at 8.20 a.m. on Saturday, 1st October, behind a "double-header," we were soon out on the plains, where repeated instances of the spread of introduced weeds were brought to our view in quick succession.

At the Kororoit Creek the common Artichoke (*Cynaria cardunculus*) is rapidly extending its domain on either bank in what one would assume to be uncongenial surroundings. In the cultivated and fallowed areas beside the railway line near Rockbank, *Erechtites quadridentata* and the agriculturist are at variance. The weed would appear to be irrepressible, for many acres of arable land may now be discerned where Hodge has retired from the contest defeated. A species of charlock, possibly *Brassica sinapistrum*, is also much in evidence among the crops, and bids fair to become as great a pest as the composite

just mentioned. Another weed, and one that is spreading despite the interdiction under which it labours, is the wild Clary (*Salvia verbenacea*). Sturdy specimens, in full bloom, could be culled on the Rockbank railway platform on 1st October.

In the railway reserve the native and exotic plants, protected alike from depasturing cattle and the agriculturist, grow profusely. Of the former, *Craspedia richea*, *Erodium cygnorum*, *Pimelea glauca*, *Brachycome cardiocarpa*, *Wahlenbergia gracilis*, *Stackhousia linarifolia*, and *Helichrysum apiculatum* were the most frequently noted. *Leptorrhynchus squamatus*, *Ptilotus macrocephalus*, and *Pimelea curviflora* were occasionally seen, and at longer intervals *Chamæscilla corymbosa* and the orchid *Diurus pedunculata*. Of the introduced plants, *Silene gallica*, *Briza maxima*, *Phalaris canariensis*, *Tunica prolifera*, and *Cryptostemma calendulaceum* were the most conspicuous. Within view of the line the eucalypts *E. melliodora* and *E. rostrata* were flowering freely, and large numbers of Rosella Parrots and an occasional Spiny-cheeked Honey-eater were observed flying from tree to tree.

Bacchus Marsh was reached about twenty minutes behind scheduled time. Passing through Maddingley Park, where not one of the magnificent native flowering shrubs that were met with a few hours later finds what should prove a congenial home, we crossed the Werribee, and continued up the main street of the township, noting on the way several splendid specimens of the Blue Gum, *Eucalyptus globulus*, and a fine avenue of Elms, *Ulmus montana*, then rapidly putting on a livery of tender green.

The township of Bacchus Marsh is situated in a large, irregular depression, surrounded by bare hills, of rounded contour and of no great elevation. In bygone ages the depression is believed to have constituted the basin of an extensive lake, when the glacial beds of the district were deposited. A comparatively narrow but well-defined lava flow may be noted occupying the high ground between the valleys of the Pyrete and Goodman's Creeks, which empty into the Lerderderg from the east. This lava, issuing from the ancient crater of Mount Bullengarook, which stands boldly up to the north, filled up the bed of the ancient river that flowed into the lake. Local tradition states that the site of the township was formerly an extensive swamp, and was settled upon and reclaimed by Captain W. H. Bacchus in the early forties.

About a quarter of an hour's walk sufficed to take us to the outskirts of the township. On our left was a crop, in which the introduced *Fumaria officinalis* was unusually prominent; whilst to our right a dense and robust growth of the Yellow Box,

Eucalyptus melliodora, seemed set in a golden carpet of Cape-weed. Along the roadway *Leptorrhynchos squamatus*, *Cotula coronopifolia*, and *Goodenia pinnatifida* were the most prominent plants. Hereabouts the works of the Darley Fire Brick Co. are situated, and the white pipe-clay beds exposed in the large excavation on the hillside form a conspicuous feature in the landscape.

Determining to proceed up the right bank of the stream, we quitted the roadway and entered a paddock in which *Cryptostemma calendulaceum*, *Erodium cygnorum*, and *Hordeum murinum* formed a luxuriant carpet. The ground was comparatively level, though with a slight fall riverwards, and evidently had formed portion of an ancient flood plain. The rank growth of Cape-weed, Crane's-bill, and Barley-grass concealed pebbles of various sorts and sizes, against which our toes repeatedly struck, rendering rapid progress a difficult matter. It was noted that only the immature trees of *Eucalyptus melliodora* met with hereabouts bore inflorescence. At a point where the river impinges against a steep cliff *Zygophyllum Billardieri*, and *Enchylæna tomentosa* were met with. Up to this point the principal birds seen were the Black-and-White Fantail, Brown Flycatcher, Chat, Pipit, Magpie, Blue Wren, Laughing Jackass, Crow, and Pallid Cuckoo.

The river flat on the right bank of the stream hereabouts is narrow, and for the most part occupied by lucerne paddocks. On the uncultivated portion *Plantago lanceolata* and *Lolium perenne* abound, and extend some distance up the sparsely-timbered slopes of the hills. Along the margin of the stream *Eucalyptus globulus* flourished, and displayed foliage of uncommon size; and on the drift sand-beds, between the gums, the flowering tree-violet, *Hymenantha Banksii*, grew profusely. Beneath its ample covert the ubiquitous "bunny" frisked and sat, and on our near approach vanished into some subterranean retreat.

On the left bank of the stream at this spot fine sections of glacial till are exposed to view, formed, for the most part, of tough, unstratified clay, interspersed with stones and boulders.

Passing beneath the drooping branches of several large trees of *Acacia decurrens*, var. *mollis*, we reached the shingly bed of the stream, and had proceeded some little distance along its course when the spectacle afforded by a luxuriant specimen of *Clematis microphylla* caused us to pause. Surrounding the small "home acre" of a humble domicile, to avoid which we had descended from the grassy flat to the river bed, was a wire fence, composed of two barbed wires, with the necessary posts. At a particular spot in the fence the clematis had climbed a post, and, extending itself along the wires, hung down in a veritable blanket of inflorescence.

We had just begun to move off, when a man's voice from the

bank above us called out—"It's better walking up here; come up." Ascending a series of rude steps cut in the steep bank of Silurian rock, we reached the spot where the man stood. He was in appearance and manner one of Nature's own, and his surroundings were in harmony. Surrounding his rude dwelling were numerous flowering growths of *Cassinia aculeata*, *Acacia montana*, *Myoporum viscosum*, and *Dianella revoluta*. Matted tufts of *Clematis microphylla* and *Cassytha melantha* sprawled in bewildering confusion over these, and here and there *Glycine clandestina* displayed its humble flowers from some *Dodonæa viscosa*. Amid these growths various breeds of fowls foraged or wandered into the garden to vary their diet by sampling the foliage of the vegetables. After prescribing, to his evident satisfaction, for a crushed hand, we thought it a favourable opportunity of promoting the labours of the Plant Names Committee by the acquisition of some information relative to the local vernaculars of the plants by which we were surrounded. The *Cassinia* was designated "Dogwood," and the *Cassytha* "Supplejack." The *Clematis* was termed "Mata," and the *Glycine* "Sarsaparilla." The *Dianella* was called "Cut-grass," and the *Myoporum* some name which both of us failed to understand. To the average field naturalist the information supplied would have more than sufficed; but one of the party, being possessed of an abnormal capacity for knowledge, still hankered for more. Indicating by an inclination of the head a flowering *Acacia montana*, he queried, with well-simulated simplicity, if it was not an acacia. The old man laughed uproariously. "You towney blokes do mix things up," he said—"why, that's not an acacia! that's myrtle scrub!" He was soon otherwise apprised, and submitted to the correction with that resignation of feeling that one manifests when he surrenders his jaw to the ministrations of a dentist.

In reply to a question respecting the auriferous properties of the river-wash hereabouts, the old man became much excited respecting the discovery in his sluice-box of a piece of metal the identity of which was a mystery to all in the neighbourhood. The discovery of the reef whence the metal was shed was confidently spoken of, and the wealth consequent thereon vaguely hinted at. Expressing a desire to view the metal, we were shown several pieces of iron pyrites. The belief, possibly, of many months was summarily shattered by a few words. The old man was for a few moments dumbfounded. On recovering his equanimity he, in a sudden burst of generosity, offered us a ruby slightly larger than a grain of wheat. This generous offer was declined, on the plea that we already had a varied assortment of gems at home; but, in reality, neither of us wished to be burdened with even a small quartz crystal.

Parting from the old man, we proceeded along the course of a water race that had been excavated in the vertical Silurian strata. Dodonæas, heavily burdened with seed-vessels, and luxuriant specimens of *Rhagodia Billardieri* abounded. Here and there *Celsia cretica*—an introduced species of the Scrophularinæ—grew among the rocks, and, in sheltered places, the ferns *Grammitis rutifolia* and *Cheilanthes tenuifolia*. The comparatively narrow flat margining the river's tortuous course was overgrown by sturdy specimens of *Hymenanthera Banksii*, and these, in turn, by *Clematis microphylla*. Amid the covert afforded by these growths the New Holland Honey-eater was to be discerned in scores. Blue Wrens and White-shafted Fantails were also in evidence, attracted thither possibly by the insects disturbed from the *Hymenanthera* by the honey-eaters.

The Silurian formation was soon succeeded by the glacial beds of the district. These formed abrupt cliffs of greater or less height. Along the crest *Indigofera Australis*, *Dianella revoluta*, and the acacias *A. pycnantha*, *A. montana*, and *A. acinacea* were often noted. At the base of the cliffs, occupying more congenial soil, *Myoporum viscosum* and *M. deserti* flourished; in company grew the Wild Tobacco, *Nicotiana suaveolens*, and the Kangaroo Apple, *Solanum aviculare*, all being in full bloom, the flowers of the latter being besieged by numerous butterflies.

In the sandy loam capping the glacial conglomerate the freshly excavated tunnels of the Orange-tipped Pardalote were noted. The birds were often seen, and their calls were as monotonous as the rush of the river on our right. Hereabouts a Blackbird was flushed from a Bottle-brush, *Callistemon salignus*. The bird, as a rule, does not range so far from the haunts of men. Here, too, a splendid specimen of the Blue Gum, *Eucalyptus globulus*, was met with, bearing carpels altogether different from the typical form. One of us, who has probably the largest and most varied collection of *Eucalyptus* carpels in the State, has nothing among his specimens of *Eucalyptus globulus*, collected in various parts of Victoria, that compare with those gathered from this particular tree. The Woolly Tea-tree, *Leptospermum lanigerum*, was occasionally seen, and the Mistletoe, *Loranthus pendulus*, proved to be more than usually abundant. About mid-day we paused for lunch beneath a large tree of *Acacia montana*—a glorious sight with its golden-yellow blooms. Near by the ruins of an old hut the introduced *Iris sub-biflora* flourished and displayed its blooms unravished by any wanton hands. The sward on which we rested comprised *Stellaria pungens*, *Hydrocotyle hirta*, *Ajuga Australis*, *Cymbonotus Lawsonianus*, and *Myosotis*